CLIMACIA AREOLARIS (NEUROPTERA: SISYRIDAE) IN LAKE TEXOMA, TEXAS AND OKLAHOMA.[1]

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ABSTRACT: Blacklight collections of *Climacia areolaris* indicate five distinct broods per year. An abundance of females was observed during dusk flight periods; however, this is most likely balanced by a later flight period for males. Specimens collected during the day showed a sex ratio close to 1:1. The presence of third instar larvae in November and fresh pupal cases in mid-August indicated the overwintering stage to be a larvae or prepupae.

DESCRIPTORS: Neuroptera, Sisyridae, *Climacia areolaris,* flight periods, spongilla flies, Spongillidae.

Sponge feeding neuropterans are widely distributed throughout the United States and are often collected in aquatic surveys. Our knowledge of the biology of sisyrids is, however, surprisingly limited. Aspects of the life history of *Climacia areolaris* (Hagen) have been detailed by Brown (1952) with observations on this and other Sisyridae being summarized by Parfin and Gurney (1956) and Resh (in press). In 1974 a survey of the Lake Texoma benthic fauna was begun at the University of Oklahoma Biological Station. Both the freshwater sponges (Spongillidae) and *C. areolaris* were among the organisms most commonly encountered. Because of the ecological importance of *C. areolaris* in Lake Texoma, special attention was given to portions of its life cycle which previously have not been reported.

Methods

Throughout the latter part of 1974 and most of 1975, *C. areolaris* were collected from the boathouse enclosure of the Biological Station. Every 7 to 10 days, a Texas type blacklight trap was run for one hour beginning 30 min after sunset. These collections were supplemented on one occasion by a series of 30 min samples throughout the night. Additional adults were taken during the day from the walls of the boathouses, and larvae and host sponges were collected from the submarged portions of the boathouses and riprap breakwater.

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Results and Discussion

Lake Texoma, completed in 1944, is a 38,050 ha reservoir on the Red River of Texas and Oklahoma. Prior to impoundment, the Red River, with its shifting sand bars and irregular flow, had a very sparse benthic fauna (Isley, 1925); and it is doubtful if sponges or spongilla flies occurred anywhere but in the upper reaches of tributaries. Sublette (1957) examined the benthos of Lake Texoma from 1949 to 1951 finding but a single colony of *Spongilla lacustris* (Linne) and no larval or adult spongilla flies. He noted that a subsequent collection in 1954 produced both *S. lacustris* and *Asteromeyenia radiospiculata* (Mills) indicating a wider distribution of sponges within the lake than originally observed. Since the mid-1950's, Brown (1974) finds that both sponges and the spongilla fly *Climacia aerolaris* have become common in Lake Texoma particularly around the boathouses at the Biological Station.

Surveys in 1974 and 1975 show sponges (*Spongilla* and *Meyenia* spp.) to be widely distributed throughout the lake. Colonies were intact until early December when water temperatures dropped below 10°C, and new colonies first appeared in mid-April as water temperatures rose above 10°C. From mid-April through early December, mature colonies, many with gemmules, were present in large numbers on submerged portions of the boathouses and the riprap breakwaters. Surprisingly, of the several hundred colonies examined, very few were inhabited by sisyrids or any other known predators of freshwater sponges.

Flight activity of *Climacia areolaris* (attraction to light traps) began in late April and at least a few were present in every collection through early October (Fig. 1). The emergence pattern does not directly correspond to water temperatures as seen in Fig. 1, but more likely is related to the production and life cycle of the sponge.

A total of 567 adults were taken in the one-hour dusk blacklight samples with greatest activity occurring in five distinct peaks (Fig. 1). The number of days between the observed peaks ranged from 31 to 45, slightly longer than the one-month cycle found by Brown (1952). Needham and Betten (1901) recorded two broods per year in New York, and Brown (1952) assumed

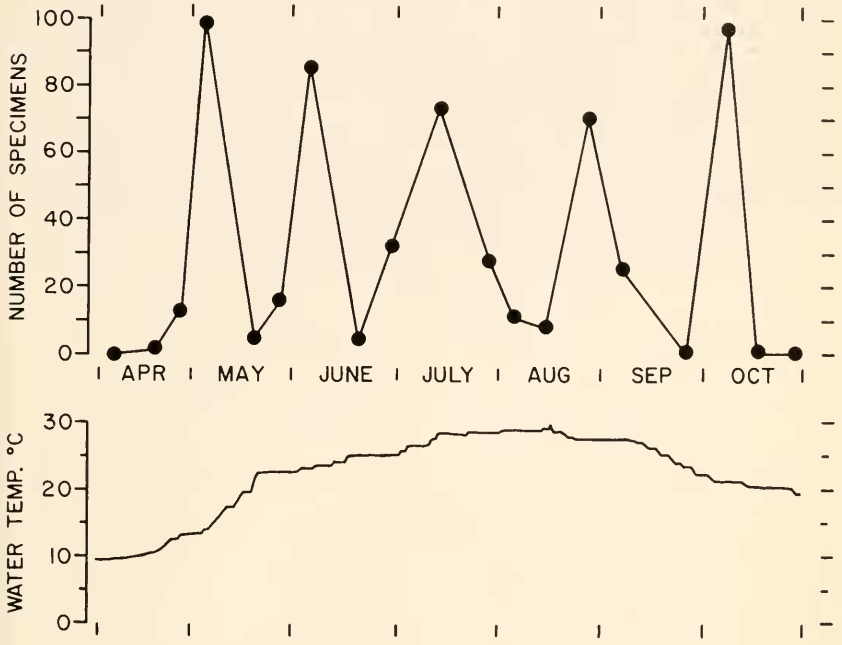

Figure 1. Numbers of *Climacia areolaris* in one-hour dusk blacklight samples during 1975, and water temperatures of Lake Texoma.

three broods and possibly a fourth in the western end of Lake Erie. Differences in climate, reflected in seasonal water temperatures from New York to western Lake Erie to southern Oklahoma, would allow a longer growing season for sponges and consequently the production of more broods of *C. areolaris.* The present study and those by Needham and Betten (1901) and Brown (1952) were in lake systems. It is interesting to note that Resh (in press), who observed *C. areolaris* flight patterns in the Salt River, Kentucky, found a continuous flight pattern throughout the summer with no distinct peaks.

Of the 567 adults collected at the dusk light traps, there were 442 females (77.9%) and 125 males (22.1%). A predominance of

females in light trap collections for certain Trichoptera has been observed by Resh and Haag (1973) and attributed either to a greater number of females within the population, a difference in phototactic response, a different flight period for males, or a combination of these factors. Harris (1971) gives further evidence that some Trichoptera females have an earlier flight period. To determine if males were more active later in the evening, several 30 min samples were taken throughout the night during the July 1975 emergence period with the following results: 8:00-8:30 PM, 9 males, 48 females; 10:00-10:30 PM, 3 males, 2 females; 2:00-2:30 AM, 1 female; 5:00-dawn, 56 males, 12 females. It is hard to conclude much from the single series; however, it is highly likely that males and females do exhibit different flight patterns. Of 103 adults collected from the boathouse walls during 1975, 56 (54.4%) were females which also indicates a sex ratio closer to 1:1 than found by examining only dusk light trap samples.

Parfin and Gurney (1956) suggest that sisyrids, particularly *Sisyra,* overwinter as larvae or prepupae. This is probably true for *C. areolaris* in Lake Texoma. Third instar larvae were collected from sponge in late November 1974 although no emergence was indicated by light trap samples until the end of April 1975. Additionally, fresh pupal cases were first noticed on the boathouse walls in mid-April just prior to the May emergence peak.

At present, *C. areolaris* is the only sisyrid known to inhabit Lake Texoma. Two male *Sisyra vicaria* (Walker) were taken at the blacklight; however, *Sisyra* larvae have not been collected from the lake, and it is likely that these were immigrants from a nearby pond.

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